

CLAIMS

1. An apparatus comprising:
a plurality of features, the features including
a plurality of primary features in a primary feature
region, each primary feature abutting at least one other
primary feature, and

a plurality of sub resolution features in a
boundary region surrounding the primary feature
region.
2. The apparatus of claim 1, wherein there is no
opaque material between adjacent features in the primary
feature region or the boundary region.
3. The apparatus of claim 1, wherein each of the
primary features has a size operative to resolve at an
imaging plane at a resolution, and

wherein each of the sub resolution features has a size
operative not to resolve at the imaging plane at said
resolution.
4. The apparatus of claim 1, wherein each of a
plurality of pairs of abutting features in the primary
feature region and the boundary region have different phase
step heights, said abutting features including primary
features and sub resolution features.
5. The apparatus of claim 1, wherein the primary
feature region comprises a chromeless alternating phase
shift mask (APSM) structure.

6. The apparatus of claim 1, wherein the boundary region comprises an outer row including sub resolution features furthest from the primary feature region.

7. The apparatus of claim 6, wherein the features have dimensional tolerances corresponding to a first lithography step precision, and

wherein the outer row has a dimension corresponding to a second lithography step precision.

8. The apparatus of claim 7, wherein said dimension of the outer row comprises a width of the sub resolution features of the outer row.

9. The apparatus of claim 7, wherein the dimensional tolerances corresponding to the first lithography step precision are smaller than dimensional tolerances corresponding to the second lithography step precision.

10. A method comprising:
defining a plurality of features in a layer of photoresist material on a mask substrate, said features including
a plurality of primary features in a primary feature region, each primary feature abutting at least one other primary feature, and
a plurality of sub resolution features in a boundary region surrounding the primary feature region; and

developing the photoresist such that the mask substrate is exposed in a first plurality of said features and the mask substrate is covered with photoresist material in a second plurality of said features;

etching the exposed mask substrate to a phase step height; and

removing the remaining photoresist material such that no opaque material remains between features in said plurality of features.

11. The method of claim 10, wherein said defining comprises defining the plurality of features in the layer of photoresist material on the mask substrate using a first lithography tool.

12. The method of claim 11, wherein the first lithography tool comprises an electron beam lithography tool.

13. The method of claim 11, further comprising:
coating the mask substrate with another layer of photoresist material; and

etching a boundary around the boundary region using a second photolithography tool, the second lithography tool having a precision less than a precision of the first lithography tool.

14. The method of claim 13, wherein the precision of the second lithography tool corresponds to a dimension of sub resolution features in an outer row of the boundary region.

15. The method of claim 13, wherein the second lithography tool comprises a laser writer lithography tool.

16. An alternating phase shift mask (APSM) comprising:

a chromeless APSM structure including a plurality of features, the features including

a plurality of primary features in a primary feature region, each primary feature abutting at least one other primary feature, and

a plurality of sub resolution features in a boundary region surrounding the primary feature region.

17. The mask of claim 16, wherein there is no chrome between adjacent features in the primary feature region or the boundary region.

18. The mask of claim 16, wherein each of the primary features has a size operative to resolve at an imaging plane at a resolution, and

wherein each of the sub resolution features has a size operative not to resolve at the imaging plane at said resolution.

19. The mask of claim 16, wherein each of a plurality of pairs of abutting features in the primary feature region and the boundary region have different phase step heights, said abutting features including primary features and sub resolution features.

20. The mask of claim 16, wherein the boundary region comprises an outer row including sub resolution features furthest from the primary feature region.

21. The mask of claim 20, wherein the features have dimensional tolerances corresponding to a first lithography step precision, and

wherein the outer row has a dimension corresponding to a second lithography step precision.

22. The mask of claim 21, wherein said dimension of the outer row comprises a width of the sub resolution features of the outer row.

23. The mask of claim 21, wherein the dimensional tolerances corresponding to the first lithography step precision are smaller than dimensional tolerances corresponding to the second lithography step precision.